

Belarus file

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Subject: Trip to Minsk (18-22 March 1996)

----- Message Contents -----

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Dear friends:

you will find enclosed my notes concerning our meetings in Minsk during the week of 18-22 March 1996.

These notes incorporate the changes requested by our Belarusian and Russian colleagues to the draft that I had previously circulated. I will send this document to Belarus as soon as the Belarusian dosimetrists tell me whom it should officially go to.

Best regards. Andre.

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7 May 1996
 Revised 17 May 1996
 André Bouville

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NOTES CONCERNING THE TRIP TO MINSK (18 TO 22 MARCH)

The main purposes of the trip to Minsk were to: (1) participate in the Conference organized by the European Commission on the consequences of the Chernobyl accident, and (2) discuss with our Belarusian and Russian counterparts the work to be done in the near future.

This paper complements the notes prepared by Gil Beebe.

1. Participation in the EC Conference.

The Conference organized by the European Commission was a big success, with more than 700 participants including practically all Belarusian, Russian, and Ukrainian scientists with significant involvement in Chernobyl studies. The Proceedings, titled "The radiological consequences of the Chernobyl accident", were part of the registration package.

Lynn Anspaugh and André Bouville presented general papers on dose reconstruction:

United States-assisted studies on dose reconstruction in the former Soviet Union
 by L. Anspaugh and A. Bouville

What is desirable and feasible in dose reconstruction for application in epidemiological studies?
 by A. Bouville, L. Anspaugh, and G.W. Beebe

while three papers addressed the methods used to reconstruct thyroid doses in Belarus, Russia, and Ukraine:

Estimation of thyroid doses received by the population of Belarus as a result of the Chernobyl accident

by Yu. Gavrilin, V. Khrouch, S. Shinkarev, V. Drozdovitch, V. Minenko, E. Shemyakhina, A. Bouville, and L. Anspaugh

The reconstruction of thyroid dose following Chernobyl

by V. Stepanenko, Yu. Gavrilin, V. Khrouch, S. Shinkarev, I. Zvonova, V. Minenko, V. Drozdovitch, A. Ulanovsky, E. Pomplun, R. Hille, A. Bailiff, A. Kondrashov, E. Yaskova, D. Petin, V. Skvortov, E. Parshkov, I. Makarenkova, V. Volkov, S. Korneev, A. Bratilova, and J. Kaidanovsky

Results of large scale dose reconstruction in Ukraine

by I. Likhtarev, B. Sobolev, I. Kairo, L. Tabachny, P. Jacob, G. Pröhl, and G. Goulko

All of those papers were well received.

2. Program of work on the Belarusan thyroid study.

On March 20, DOE and the Belarusan Ministry of Health signed a Funding Arrangement, according to which DOE will provide local assistance to the Ministry of Health of Belarus as long as specified scientific milestones are met within a given timeframe. A copy of the most recent available draft of the Funding Arrangement as well as of its Annex 1, in which the milestones to be met by the Belarusan scientists during the first 3 months of the study are identified, are provided as **Appendix M1**. The Russian dosimetrists will also receive local assistance, in the framework of an arrangement with the Lawrence Livermore National Laboratory. The milestones to be met by the Russian dosimetrists during the first 3 months of the study are identified in **Appendix M2**.

Even though the BelAm thyroid study has not officially started (the starting point is to coincide with the receipt of initial funds from DOE, and those funds cannot be sent until certain administrative procedures are completed in the U.S. and in Belarus), it was decided to take advantage of the EC Conference to hold meetings with our Belarusan and Russian colleagues in order to discuss the program of work and other matters. For reasons of convenience, two separate meetings were held, one with our Belarusan colleagues, and the other with our Russian colleagues. Participated in those meetings:

From Belarus: Viktor Minenko, Vladimir Drozdovitch, and Alexander Ulanovsky.

From Russia: Valeri Khrouch, Yuri Gavrilin, and Sergey Shinkarev.

From the U.S.: Lynn Anspaugh and André Bouville.

2.1. Discussion of the "Belarusan" milestones

The dosimetry milestones to be met by the Belarusans during the first three months of the study are found in the Funding Arrangement (**Appendix M1**) as Task No. 7 "The estimation of individual thyroid doses for members of the cohort." and consist of:

Milestone 15: Compilation of data on the response of the SRP-68 detector for sources of various energies located in the thyroid and in other parts of the body.

Milestone 16: Feasibility of deriving Iodine-131 fallout from Iodine-129 measurements in soil: results of the campaign of soil sampling of May 1993.

Milestone 15 deals with the work that Alexander Ulanovsky has accomplished in Minsk and in Oak Ridge. The milestone should be easily met as it consists essentially in organizing and reviewing available results. It should be remembered, however, that this milestone constitutes only the first step of an ambitious, but necessary, program of re-evaluation of the thyroid measurements. The opinion of the dosimetrists is that this program would be best accomplished if Alexander Ulanovsky returned to Oak Ridge for long visits. This, however, may pose political and financial problems.

Milestone 16 also has to do with organizing and reviewing available results. On the basis of a

preliminary examination, it seems feasible to use I-129 measurements in soil to derive I-131 fallout. If this is confirmed, then an extensive (and expensive) program of soil sampling and analysis for I-129 is to be envisaged. At the Bad Honnef meeting in November 1995, it was shown clearly that Livermore was at least one year ahead of everybody else as far as I-129 measurements in environmental samples was concerned. This should put us in a comfortable position to (1) develop our own program, or (2) lead an international effort if sufficient funds cannot be found in the U.S.

The possibility of taking one soil sample in each of the 119 raions of Belarus was discussed and tentatively endorsed. This would: (1) yield a coarse coverage of I-131 fallout for the entire country, (2) show the areas of the country where I-131 fallout can be relatively well predicted from Cs-137 deposition data, and (3) point to areas where more soil samples need to be taken. Viktor Minenko indicated that there would be a political difficulty to carry out this program: it is now forbidden to provide environmental samples from Belarus to foreigners without authorization from the Chernobyl Ministry. One solution would be to rely on the Belarusians for sampling and processing the soil samples, then argue that the processed soil samples need to be analyzed at Livermore because there is no accelerator-mass spectrometer in Belarus.

Soil sampling could be done by Viktor Minenko and his staff over the next year or so. It would not be necessary to take soil samples in such a way that the I-129 depth profile could be measured. One representative superficial soil sample (0-15 cm) and one deep sample (15-30 cm) would be sufficient for each site. Also, it would not be necessary to carry out field gamma spectrometry, as it would be sufficient to determine that the exposure rate is relatively constant over the area selected. However, there would be substantial expenses (vehicles, gasoline, per diem, ...) that would have to be covered by the U.S.

Soil processing (including the chemical extraction of iodine) could possibly be done at the Institute of Energy Problems of the Academy of Sciences (where historical soil samples may be available). The week after our meeting, Tore Straume visited that Institute and concluded that soil processing could be done at the Institute if it is demonstrated that the Institute, which is the site of a research reactor, is not contaminated with I-129. Also, transfer of know-how and procurement of standard chemical equipment would have to be effected, as well as support for 2 or 3 persons. All things considered, however, it would be cheaper to have the soil samples processed at Minsk than at Livermore.

Analysis of the processed soil samples for I-129 would be done by accelerator-mass spectrometry and would take place at Livermore. Soil sampling and processing should be organized in such a way that there is a relatively steady flow of samples for analysis.

A more detailed discussion will be held during our next Belarusan-Russian-U.S. dosimetry meeting.

In addition to the work associated with the specified milestones, work is expected to be done on the items identified in the List of Tasks (see **Appendix M2**), even in the first months of the study. Milestones expected to be accomplished at later dates during the first and successive years of the

BelAm Thyroid Study will be on the basis of the List of Tasks and will be of two types: (1) long-term objectives of the study, which will be specified within two months of signing the Funding Arrangement, and (2) several interim milestones, to be completed during successive three-month intervals; these interim milestones for each interval will be identified approximately two weeks before the end of each quarterly reporting period.

2.2. Discussion of the "Russian" milestones

The milestones for the Russian dosimetrists are described in **Appendix M2**. The first one, three months after the beginning of the study, would consist of a report on the distribution of the current estimates of individual thyroid doses according to dose interval (0-0.3 Gy; 0.3-1 Gy; 1-3 Gy; 3-10 Gy; >10 Gy), age class (in utero; 0-5 y; 5-10 y; 10-14 y; 14-18 y), and raion of origin. However, as long as a Funding Arrangement has not been signed with the Moscow dosimetrists, the milestones described in **Appendix M2** can be changed.

Although the study has not officially begun since the Funding Arrangements have not been enforced, the U.S. dosimetrists tried to convince the Belarusan and Russian dosimetrists to work on their milestones before our next meeting. According to the wishes of the U.S. dosimetrists, the reports related to the milestones would be e-mailed to the other countries before our next meeting, then discussed at that meeting. The reports are not expected to be either long or detailed; their purpose is to show that the milestones have been met.

3. Other.

3.1. Dosimetry Questionnaire.

At the request of Viktor Minenko, the dosimetry questionnaire was reviewed in the U.S. for its epidemiological aspects by Gil Beebe and for its clinical aspects by Jack Robbins. Their suggestions are incorporated in a revised draft, included as **Appendix M3**. This revised draft will be discussed during our next dosimetry meeting.

It is important to make sure that all dosimetrists agree on the contents of the questionnaire since the decision was made that a dosimetrist will perform the personal interviews, at least during the dry run and the beginning of the study.

3.2. Plans for an environmental radiation database.

Plans for preparing an environmental radiation database are in limbo. The limited pilot study that was carried out last year showed that the preparation of such a database is feasible and that it should be done quickly in order to make sure that the primary data do not get lost. The problem is that it becomes increasingly clear that several outside organizations from the former Soviet Union would need to be included and that it is difficult for the U.S. dosimetrists to commit themselves without guarantee that appropriate funding will be available from DOE, NCI, or NRC.

A possible approach could be to treat this aspect of the study as an independent research program

and to request separate funding for this program. If this approach is acceptable to all, we could prepare a research proposal during our next dosimetry meeting, including an estimation of the funds that would be required and a listing of all the organizations that could be involved. Funding for organizations other than the Minsk Institute of Radiation Medicine and the Moscow Institute of Biophysics would not be drawn from the monies allocated to those Institutes for the BelAm study. Before our next meeting, Valeri Khrouch will try to determine which, of the 3 groups in Obninsk that have accumulated radiation data, would be the most helpful for our program.

3.3. Dosimetry papers.

Four joint papers are or should be in preparation.

A paper on the general aspects of the case-control study is soon to be submitted to the New England Journal of Medicine. A "final" draft is being circulated to the authors (including 3 Minsk dosimetrists and 3 Moscow dosimetrists). The current title and authors are:

"Chernobyl-related thyroid cancer in children of Belarus: a case-control study.

L.N. Astakhova, L.R. Anspaugh, G.W. Beebe, A. Bouville, V. Drozdovitch, V. Garber, Y.I. Gavrillin, V.T. Khrouch, A.V. Kuvshinnikov, Y.N. Kuzmenkov, V.P. Minenko, V.V. Moshchik, A.S. Nalivko, J. Robbins, E.V. Shemyakhina, S. Shinkarev, S.I. Tochitskaya, M.A. Waclawiw."

A paper on the dosimetric aspects of the case-control study is to be prepared. I agreed to prepare an extended outline of this paper, to be discussed at our next dosimetry meeting. The title and authors could be:

"Estimation of thyroid doses received by Belarusian children with thyroid cancer following the Chernobyl accident: methodology and results.

S.M. Shinkaryov, E.V. Shemyakhina, V.P. Minenko, V.T. Khrouch, Y.I. Gavrillin, V. Drozdovitch, A. Bouville, L.R. Anspaugh."

A paper describing all aspects of the May 1993 soil sampling campaign has been planned for about one year. Assignment of responsibilities should be discussed again during our next meeting.

A paper retracing the history of the thyroid dose reconstruction efforts in Belarus after the Chernobyl accident has been conditionally accepted by Health Physics. Hopefully, the revisions (to be done essentially by me) will be completed before our next dosimetry meeting. The title and authors are:

"Chernobyl accident: reconstruction of thyroid dose for inhabitants of the Republic of Belarus. Y.I. Gavrillin, V.T. Khrouch, S.M. Chinkarev, N. Kryssenko, A. Skryabin, A. Bouville, L.R. Anspaugh, T. Straume."

3.4. Next meeting

The dates and location agreed upon for the next dosimetry meeting are:

24-28 June 1996 in Minsk.

It is sincerely hoped that all the administrative barriers will have been overcome by then, so that

we can work together without restraint.

APPENDIX M1 TO THE MINSK TRIP REPORT (18-22 MARCH 1996)*DRAFT**18 March 1996***FUNDING ARRANGEMENT**

**Between the Department of Energy of the United States of America
and the Ministry of Health of Belarus for Support of the
U.S.-Belarus Thyroid Study**

Purpose:

The purpose of this Funding Arrangement is to establish the framework for the receipt, distribution, and accountability of funds to be provided by the U.S. Department of Energy (hereafter referred to as the DOE) to the Ministry of Health of Belarus (hereafter referred to as the Ministry) in support of research activities carried out in accordance with the "Letter Arrangement for Continuing Cooperation on the Implementation of the Scientific Protocol for the Study of Thyroid Cancer and Other Thyroid Disease in Belarus Following The Chernobyl Accident," which was signed in Washington, D.C., on 26 May 1994. Separate arrangements are being utilized to procure equipment and supplies used in this study; the U.S. Government has already committed to the purchase of more than \$500,000 worth of equipment and supplies during the 1995-1996 years. The work/milestones to be done under this Arrangement are detailed in Annex I. The format for financial reporting requirements is described in Annex II. The project will be referred to as the BelAm Thyroid Study.

Parties:

The responsible parties will be the Director, Office of International Health Programs of the U.S. Department of Energy and the Deputy Minister of Health of Belarus in charge of Chernobyl Affairs, Ministry of Health, Belarus.

Scope:

The scope of the Arrangement pertains only to those funds transferred directly by the DOE to the Ministry for the purpose of support and services for activities directly related to the BelAm Thyroid Study.

Areas of Agreement:

1. The DOE will provide to the Ministry, U.S. monies to be allocated, distributed, and used solely for the development and implementation of the BelAm Thyroid Study.
2. With the signing of this document and concurrence on the milestones in Annex I for the first three months, the first transfer of U.S. monies will be initiated in the amount of \$20,000.
3. The U.S. will contribute a total of \$20,000 every three months for a one year time period (total U.S. contribution = \$80,000) to supplement personnel costs incurred on work related to the BelAm Thyroid studies. Both parties agree that the following objectives should be accomplished:
 - o The Government of Belarus will provide salary support for personnel working on the study upon signing

of this agreement.

- o An exemption will be provided from all custom fees and taxes on all equipment, vehicles and other material provided by the U.S. for use in this project within a month of signing this agreement.
 - o The BelAm Thyroid Study will be accorded the status of a State Project as soon as possible and no later than 3 months after signing this agreement.
 - o The U.S. Department of Energy should receive an invoice before the initial transfer of money; this invoice should specify the number of person-months anticipated to accomplish the milestones for the first three months.
4. U.S. monies will be allocated in the following manner:
- o No more than ten (10) percent of the total of all DOE monies shall be used for administrative or indirect costs directly related to the BelAm Thyroid Study;
 - o The remainder of the monies shall be allocated for *supplementary* personnel support. Personnel support is understood to include primarily direct salary supplementation allocated to individual project personnel based on the percent effort each spends on the BelAm Thyroid Study and their professional duties in the study. Funds will be allocated in two categories: support personnel will be paid a minimum of \$50.00 per month with a maximum five-fold increase depending upon the level of responsibility; professional staff will be paid a minimum of \$100.00 per month with a maximum five-fold increase depending on the position of responsibility.
5. U.S. monies will be transferred directly to the Ministry of Health, Belarus. They should not be subject to taxes, duties, or other handling or administrative charges beyond modest bank transfer fees. The initial transfer of U.S. monies will be made after official receipt of information that the U.S. monies will be exempt from all taxes.
6. Subsequent funding will be transferred on a quarterly basis provided that the DOE is in receipt of:
- o An appropriate expenditure report for the previous funding period using the format specified in Annex II;
 - o The milestones accomplished in the previous funding period as specified in Annex I; and
 - o Updated milestones covering the next funding period
 - o An invoice from the Ministry describing the number of person-months anticipated to accomplish the updated milestones for the next funding period
7. Reports are to be sent to the DOE Office of International Health Programs with copies sent to the National Cancer Institute.
8. Continuation of incremental funding is contingent upon the Government of Belarus providing salary support for the BelAm Thyroid Study.

Oversight:

At intervals not to exceed every six (6) months, U.S. representatives will visit the Ministry to review the administration of the BelAm Thyroid Study and the accounting for the expenditure of U.S. funds. The Ministry will provide office space and necessary information and assistance to the U.S. representative while in Minsk.

General Provisions:

Cooperation under this Agreement will be in accordance with the laws and regulations under which each party operates. Monies shall be provided subject to the availability of appropriated funds and to the mutual consent of the two parties. Both parties agree to keep each other informed about any developments that may impact the implementation of this project.

Entry into Force and Terminations:

This Funding Agreement shall enter into force upon signing by both parties and remain in force for one (1) year. This Agreement may be amended at any time by mutual consent of the parties. This Agreement may be terminated by either party upon ninety (90) days written notice to the other party.

**For the U.S. Department of Energy
Office of Health Studies**

**For the Ministry of Health
of Belarus**

Date:

Date:

Annex 1**BelAm THYROID STUDY****Tasks and milestones**

The BelAm Study will consist of a number of tasks. Some of these tasks may begin or be completed at different times, while others, such as the clinical examination of the cohort and dose estimation, are expected to continue for many years. As the Study progresses, some tasks may be re-defined and others added.

Milestones can be associated with those tasks. On completion of each milestone, a report will be prepared and submitted to DOE.

The tasks, as currently identified, are given below along with the milestones expected to be accomplished within 3 months of receipt of funds from DOE. Milestones expected to be accomplished at later dates during the first and successive years of the BelAm Thyroid Study will be of two types: (1) long-term objectives of the study, which will be specified within two months of signing the Funding Arrangement, and (2) several interim milestones, to be completed during successive three-month intervals; these interim milestones for each interval will be identified approximately two weeks before the end of each quarterly reporting period.

Task No. 1: The management and administration of the BelAm Thyroid Study.

Milestone 1: Approval of the BelAm Thyroid Study as a State Project.

Milestone 2: Organizational structure of the BelAm Thyroid Study and identification of responsible persons for each Task.

Milestone 3: Selection of the Members of the Oversight Committee and proposed date for the first meeting of that Committee.

Task No. 2: The establishment of the cohort of subjects for study.

Milestone 4: Designation of 600 potential subjects meeting quality criteria for the Study cohort.

Milestone 5: Location of 200 subjects accessible to the Minsk Dispensary.

Task No. 3: The invitation and scheduling of subjects for endocrinologic examination.

Milestone 6: Preparation of the letters of invitation, software, and procedures for inviting and scheduling subjects for examination.

Task No. 4: The endocrinologic examination of subjects, including subsequent diagnostic procedures leading to the establishment of the final pathologic diagnosis.

Milestone 7: Completion of all pilot work on the screening program, including the

laboratory work.

Milestone 8: Completion of all training and certification in Minsk Dispensary.

Milestone 9: Completion of installation and testing of equipment to store thyroid images in the magnetic-optical drives in Minsk Dispensary.

Milestone 10: Completion of the Operations Manual and study forms based on the pilot.

Task No. 5: The establishment and operation of a central laboratory.

Milestone 11: Completion of preparations for storage of blood and microscopic slides.

Task No. 6: The establishment and operation of a Data Coordinating Center for data management.

Milestone 12: Transfer of DCC from Masheroova Str. to the new place (if it is necessary) and reinstallation of new equipment.

Milestone 13: Design of software for printing BAR-CODE labels and registration logs.

Milestone 14: Creation of the filing systems for hard-copy (paper) records in all divisions of the project.

Task No. 7: The estimation of individual thyroid doses for members of the cohort.

Milestone 15: Compilation of data on the response of the SRP-68 detector for sources of various energies located in the thyroid and in other parts of the body.

Milestone 16: Feasibility of deriving Iodine-131 fallout from Iodine-129 measurements in soil: results of the campaign of soil sampling of May 1993.

APPENDIX M2 TO THE MINSK TRIP REPORT (18-22 MARCH 1996)

26 January 1996

Revised 17 May 1996

André Bouville

Appendix 2 -

Dosimetry for the BelAm Thyroid Study:

Current status of tasks expected to be in progress or completed during the next three years and of deliverables to be expected during the next year.

A - LIST OF TASKS

1. Re-evaluation of the response of the detectors used for the direct thyroid measurements:

1.1. Monte-Carlo calculations of various source terms and geometries on the detector response (**Minsk: 36 person-months**). Team with primary responsibility: Minsk. Priority: high. Urgency: high.

1.2. Estimation of the time dependence of the intake of radionuclides for groups of people from various areas of Belarus (**Moscow: 12 person-months; Minsk: 12 person-months**). Team with primary responsibility: Moscow. Priority: high. Urgency: high. Comment: Minsk has whole-body data of unwashed people (whole-body measurements taken in June-July 1986), which could be used to derive radionuclide intake in May 1986.

1.3. Estimation of the time dependence of the external contamination of skin and of clothes for groups of people from various areas of Belarus (**Moscow: 12 person-months; Minsk: 6 person-months**). Team with primary responsibility: Moscow. Priority: high. Urgency: high.

1.4. Re-evaluation of the direct thyroid measurement data and of their uncertainties (**Minsk: 8 person-months and Moscow: 24 person-months**). Team with primary responsibility: Moscow. Priority: high. Urgency: low.

2. Estimation of the time dependence of the radioiodine intakes and of the thyroid burdens:

2.1. Chronology of radioiodine (Iodine-131, Iodine-133, and, if possible, Iodine-132) deposition over Gomel and Mogilev Oblasts (first priority) as well as over other Oblasts of Belarus (second priority). Team with primary responsibility: Moscow. Priority: high. Urgency: intermediate.

Comment: an attempt will be made to obtain those data from Taifun. There are 3 teams in Taifun that may have relevant data (Makhonko, Orlov, and Kryshev/Sazykina). Before the EC meeting in March, our Moscow colleagues will try to find out which of the 3 teams has the best data for our purpose. André Bouville will ask Belgidromet about the origin of the data they used to prepare the I-131 map as well as about rainfall. A collaboration between Taifun and NOAA could be envisaged if an atmospheric and deposition model is to be used.

2.2. Determination of other factors needed to evaluate the time dependence of radioiodine intake, such as the date when cows were first put on pasture, the dates when people were relocated and resettled, the information on iodine prophylaxy (**Moscow: 8 person-months; Minsk: 24 person-months**). Team with primary responsibility: Moscow. Priority: high. Urgency: intermediate.

Comment: Moscow will process its 110,000 interviews, which are already in computer

form, in order to obtain this information. Minsk will try to obtain the "official" information (Orders to relocate and resettle, reports from special teams concerning iodine prophylaxy, and agriculture reports from collective farms regarding the date cows were put on pasture). This official information is scattered throughout the country and may not be easy to locate and/or obtain.

2.3. Investigation of the origin and distribution of milk and milk products in urban centers of Belarus, with priority to the cities in Gomel and Mogilev Oblasts (**Minsk: 24 person-months**). **Comment: the two principal sources of information are: (1) the Departments of Trade of the cities, and (2) milk plants outside Gomel and Mogilev Oblasts. However, many documents may be lost, because the archiving period may have expired.**

Team with primary responsibility: Minsk. Priority: high. Urgency: intermediate.

2.4. Determination of the time dependence of the radioiodine intake (Iodine-131, Iodine-132 (via Tellurium-132) and Iodine-133) and thyroid burden for the populations of various areas of Belarus (**Moscow: 12 person-months; Minsk: 12 person-months**). Team with primary responsibility: Moscow. Priority: high. Urgency: low.

3. If needed: In-depth evaluation of the feasibility to reconstruct thyroid doses received by children of the Brest Oblast on the basis of the direct thyroid measurements made in Brest Oblast in May-June 1986 (**Minsk and Moscow: 30 person-months for each team**). **A decision about the need to accomplish this task will be made later by the Project Director.**

4. Individual interviews of children included in the cohort in order to obtain information of dosimetric interest (**Minsk: 72 person-months**). Team with primary responsibility: Minsk. Priority: high. Urgency: high.

Comment: The Minsk dosimetry team will be responsible for conducting the interviews and will ask both the dosimetric and the epidemiologic questions. The U.S. epidemiologists are requested to review the questionnaire before the pilot run scheduled to take place early February.

5. Determination of the thyroid doses received by the children in the cohort as a result of external irradiation due essentially to the presence of radiocesium on the ground:

5.1. Establishment of a validated environmental radiation database (**Belgidromet: 24 person-months; Minsk: 6 person-months; Moscow: 6 person-months**). Team with primary responsibility: Minsk. Priority: high. Urgency: intermediate.

Comment: There are differences of opinion about the usefulness of Belgidromet for this Task. The Institute of Nuclear Energy, where many environmental samples were analyzed in the spring of 1986, could become involved in the place of Belgidromet. The decision on how and when to proceed is postponed until a financial agreement is reached. Before the EC meeting in March, André Bouville will ask Belgidromet whether they have entered all of the exposure rate data in their database.

5.2. Determination of individual doses (**Minsk: 8 person-months; Moscow: 3 person-months**). Team with primary responsibility: Minsk. Priority: high. Urgency: intermediate.

6. Determination of the thyroid doses received by the children in the cohort as a result of internal irradiation due to the presence of radiocesium in the body (**Minsk: 48 person-months; Moscow: 3 person-months**). Team with primary responsibility: Minsk. Priority: low. Urgency: low.

Comment: It would be desirable to develop a database with the very large number of whole-body measurements that have been made in order to cross-check it with the thyroid measurements. Unfortunately, this is a highly time-consuming task that may not be warranted in view of the usually low contribution of the internal dose from radiocesium in the body.

7. Improvement of the determination of the individual thyroid doses derived from direct thyroid measurements (corrections resulting from: (a) the re-evaluation of the direct thyroid measurement data and of their uncertainties; (b) the estimation of the time dependence of the radioiodine intakes and of the thyroid burdens; and (c) the reevaluation of the personal interviews. **(Moscow: 48 person-months; Minsk: 24 person-months)**. Team with primary responsibility: Moscow. Priority: very high. Urgency: low.

Comment: This task represents the preparation of the first version of the final database. The thyroid dose estimates should consist of 4 components: (1) Iodine-131 in the thyroid; (2) short-lived radioiodines in the thyroid; (3) radionuclides other than radioiodines in the body; and (4) external irradiation. In the meantime, a new database presenting the currently-available information, including data from personal interviews (there is a rather large number of people with both thyroid measurements and personal interviews), will be delivered by the Moscow team to the Ministry of Extraordinary Situations by the end of February 1996.

8. Development of methods to estimate Iodine-129 deposition, and, in turn, to obtain a better estimation of the deposition pattern of Iodine-131:

8.1. Sample collection, processing, and gamma-spectrometric measurements **(Minsk: 15 person-months; Moscow: 5 person-months)**. Team with primary responsibility: Minsk. Priority: high. Urgency: intermediate.

8.2. Sample analysis by β -X coincidence method, if achievable and desirable **(Moscow: 12 person-months)**. Team with primary responsibility: Moscow. Priority: high. Urgency: intermediate.

8.3. Improvement of model to estimate Iodine-131 thyroid doses **(Minsk : 3 person-months; Moscow: 6 person-months)**. Team with primary responsibility: Moscow. Priority: high. Urgency: intermediate.

Comment: Because the feasibility of deriving Iodine-131 deposition from measurements of Iodine-129 in soils seems to have been demonstrated in the pilot study, the next step that is envisaged is a Republic-wide investigation, with a site sampled in each of its 119 raions.

9. Preparation of an Operations Manual for dosimetry **(Minsk and Moscow: 6 person-months for each team)**. Team with primary responsibility: Minsk. Priority: high. Urgency: high.

10. Preparation of internal reports and of scientific publications in English **(Minsk and Moscow: 12 person-months for each team)**. Team with primary responsibility: Moscow. Priority: high. Urgency: intermediate.

Tasks that are not included in the Protocol, but would be very useful to validate the thyroid dose estimates:

11. Validation of the thyroid doses derived from direct thyroid measurements by means of dose

formation models (**Minsk: 5 person-months; Moscow: 10 person-months**). Team with primary responsibility: Moscow. Priority: intermediate. Urgency: low.

12. Improvement of the determination of the passport doses for towns and settlements of the Gomel and Mogilev Oblasts (**Moscow: 18 person-months**). Team with primary responsibility: Moscow. Priority: intermediate. Urgency: low.

B - LIST OF DELIVERABLES

According to current thinking, Minsk would be funded directly by the U.S. Department of Energy, while Moscow would be funded by Livermore.

Deliverables from Minsk would consist of reports on topics for which tangible results would have been obtained; such reports would be provided every 3 months. In addition, work of a continuous nature (such as the conduct of interviews, the analysis of environmental and human radiation data, and other topics specified in the List of Tasks) is expected to be performed regularly

Deliverables from Moscow would also consist of reports on specific topics; in addition, short progress reports (about one-page long) would be provided every month in order to ensure payment of local assistance on a monthly basis.

Assuming that an agreement between the U.S. Department of Energy and the Ministry of Health of Belarus is reached in February 1996, the following deadlines and topics for deliverables could be envisaged:

31 March 1996:

Moscow: progress report.

30 April 1996:

Moscow: progress report.

31 May 1996:

Minsk: Report on the response of the SRP-68 detector for sources of various energies located in the thyroid and in other parts of the body.

Minsk: Report on the results of the campaign of measurement of Iodine-129 in soils of May 1993.

Moscow: Report on the distribution of the individual thyroid dose estimates according to dose interval (0-0.3 Gy; 0.3-1 Gy; 1-3 Gy; 3-10 Gy; >10 Gy), age class (in utero; 0-5 y; 5-10 y; 10-14 y; 14-18 y), and raion of origin.

30 June 1996:

Moscow: progress report.

31 July 1996:

Moscow: progress report.

31 August 1996:

Minsk: Report on the Cs-137 concentrations in milk, the body burdens of Cs-137, and on the exposure rates in air measured in 9 raions of the Gomel Oblast and in 5 raions of the Mogilev Oblast since the accident.

Moscow: Report on the data available on external contamination of skin and clothes, broken down according to age class (0-5 y; 5-10 y; 10-14 y; 14-18 y), and raion of origin.

30 September 1996:

Moscow: progress report.

31 October 1996:

Moscow: progress report.

30 November 1996:

Minsk: Report on the origin and distribution of milk and milk products in the urban centers of the Gomel Oblast.

Moscow: Report on the data available on the factors needed to evaluate the time dependence of radioiodine intake in 9 raions of the Gomel Oblast; examples of such factors are the date when cows were first put on pasture, and the dates when people were relocated and resettled.

31 December 1996:

Moscow: progress report.

31 January 1997:

Moscow: progress report.

28 February 1997:

Minsk: Progress report on the results of the interviews of children included in the cohort regarding the consumption rate of milk according to age class (with an analysis of the regional differences and of urban/rural differences), the consumption rate of leafy vegetables according to age class, and the intake of stable iodine for prophylactic reasons.

Moscow: Report on the analysis of the 110000 interviews conducted in the contaminated areas of Belarus in 1988 regarding the consumption rate of milk according to age class (with an analysis of the regional differences and of urban/rural differences), the consumption rate of leafy vegetables according to age class, and the intake of stable iodine for prophylactic reasons.

Moscow: Report on the chronology of radioiodine (Iodine-131, Iodine-133, and, if possible, Iodine-132) deposition in 9 raions of the Gomel Oblast and in 5 raions of the Mogilev Oblast.

**(REVISED APPENDIX 5 OF THE MINSK TRIP REPORT
(23-26 SEPTEMBER 1995))**

[The questions for which changes are suggested are numbered in bold characters; *changes are suggested in italics.*]

DATA FROM INDIVIDUAL QUESTIONNAIRE INQUIRY (BASELINE)

1. Date of inquiry: Day Month Year
2. Code of Questioned Person: Self-examined = 1
☐ Mother = 2
 Father = 3
 Sister, brother = 4
 Son, daughter = 5
 Other relative = 6
 Other = 7
3. Surname of subject:
- Surname at the time of the accident:
4. First name of the subject:
5. Patronymic name of subject:
6. Date of birth of subject: Day Month Year
7. Sex of subject: male = 1
☐ female = 2
8. Home address at present time: _____

 Telephone: _____

9. Were you evacuated from the contaminated territory: ☐

yes = 1
no = 2

Date of evacuation from contaminated territory:

Day ☐ ☐ Month ☐ ☐ Year ☐ ☐

10. Address at the time of the accident: _____

Type of residence: ☐ one-floor = 1 ☐ wood = 1
multi-floor = 2 stone = 2
brick = 3

11. Were you evacuated or were you left on your own during the period of the accident (April-May 1986):

(not clear: is it a 2nd evacuation?)

☐ yes = 1
no = 2

Date of evacuation: day month

☐ ☐ ☐ ☐

12. Did you attend a school or pre-school facility in the spring of 1986?

kindergarten = 1

☐ school = 2
did not attend = 3

13. Did you limit the amount of time you spent outdoors after the accident, in comparison to your usual habits at this time of the year? (be more specific, i.e., hours per day)

☐ yes = 1
no = 2

When? day month not sure

☐ ☐ ☐ ☐ ☐ ☐

If not sure (exact date unknown), indicate all that apply:

end of April = 1
first days of May = 2
middle of May = 3
end of May and later = 4

How long did you change your habits? ☐ number of weeks

How much time did you spend outdoors at this time of the year before the accident (hours per day)?

spring

summer

14. Usual consumption of milk before the accident:

☐ ☐
☐ ☐
☐

every day = 1

a few times a week = 2

did not consume milk = 3

How many glasses a day?

☐

15. Milk consumption after accident during April-May 1986:

from private farm = 1

cow's milk = 1

☐

from store = 2

☐

goat's milk = 2

from local dairy = 3

as usual = 1

☐

discontinued consumption = 2

When did you discontinue consuming milk from the indicated source?

Day

Month

If exact date unknown:

☐ ☐
☐ ☐
☐

end of April = 1

first days of May = 2

middle of May = 3

end of May and later = 4

When did you change over to consuming milk from another source?

Day

Month

If exact date unknown:

☐ ☐
☐ ☐
☐

end of April = 1

first days of May = 2

middle of May = 3

end of May and later = 4

From a store = 1

☐

powdered milk = 2

concentrated milk = 3

Did you consume your mother's milk after the accident:

yes = 1

☐

no = 2

When did your mother stop nursing you?

Day

Month

If exact date unknown:

☐ ☐
☐ ☐
☐

end of April = 1

first days of May = 2

middle of May = 3
end of May and later = 4

16. Consumption of milk products (food) after accident in April 1986.
 (list the possible food products and frequency of consumption (daily, once a week, rarely?))

What products:

What amount:

17. Consumption of green leafy vegetables in April-May 1986:

yes = 1 locally produced = 1

☐ no = 2 ☐ trucked in = 2

When did you begin to consume them?

How often in a week? ☐

end of April = 1

☐ first days of May = 2

middle of May = 3

end of May = 4

18. Iodine prophylaxis carried out in April-May 1986:

yes = 1

☐ no = 2

don't remember = 3

Beginning of prophylaxis:

Day Month

☐ ☐

☐ ☐

If exact date unknown:

☐ ☐

end of April

= 1

first week of May = 2

second week of May = 3

end of May = 4

How many times did you take iodine preparations? ☐

Describe the iodine preparation:

colorless liquid = 1

☐ *brown liquid* = 2

pill = 3

antistrumin = 4

Who conducted the iodine prophylaxis? independently = 1

☐ local physicians = 2

in local evacuation centers = 3

19. Trips away from point of permanent residence in 1986 (in connection with the evacuation; on days off and holidays in April - May; rest; residence, etc.), and also correspondingly indicate time spent in open air (hours per day) and amount of milk consumed at the other localities (glasses per day):

Trips in 1986			From	To	Time outdoors	Milk co
Oblast	Raion	Settlement	(Date)	(Date)	(h/d)	(glasses/

20. Trips away from population center (*place of residence?*) for a period of more than 1 month and trips to other localities in subsequent years:

Year	Destination (oblast, raion, settlement)	Length of stay (
------	---	------------------

21. Usual daily diet (*before the accident?*):

☐ glasses of milk ☐ grams of potatoes ☐ grams of meat

Regular consumption of local mushrooms: ☐ yes = 1
no = 2

22. How often were you examined with a whole-body counter: _____

where _____ when _____ (month, year)

where _____ when _____ (month, year)

where _____ when _____ (month, year)

23. Did you undergo regular roentgenologic and fluoroscopic examinations? [*It is not clear what is meant by this; to be checked with Belarus*]

annually: ☐ yes = 1

no = 2

24. Did you undergo diagnostic examination with the use of radiopharmaceuticals? *[Is not this too complicated? Would the subject know about this?]*

where: _____
name of medical facility, town

when: Month Year

25. Did you undergo *radiation treatments*?

☐ *yes* = 1
no = 2

If the answer is "yes", for what reason?-----
 type of radiation treatment: X-ray =1
 other =2

where: _____
name of medical facility, town

when: Month Year
 □ □ □ □

26. Your health at the present time (give only one answer)

Excellent	= 1
Very good	= 2
Good	= 3
So-so	= 4
Bad	= 5

27. Your health compared to what it was in 1986 (give only one answer)

Much better = 1
A little better = 2
No difference = 3
A little worse = 4
Much worse = 5

28. Did you have an operation *since 1986*? No = 1

Yes = 2 (fill in the Table below)

Type of operation

Part of body

Year

29. (1) Were you examined or hospitalized some time and for what reason?
(answer yes or no to each of the following questions)

a. Cancer? 1 = No 2 = Yes

If the answer is yes, indicate the date of diagnosis:

Day??

Month

Year

..

..

....

Are you included in the cancer registry?

1 = No

2 = Yes

3 = Not sure

What type of cancer? _____

b. Leukemia? 1 = No 2 = Yes 3 = Not sure

c. Cataract? 1 = No 2 = Yes 3 = Not sure

d. Thyroid trouble? 1 = No 2 = Yes 3 = Not sure

If the answer is yes, indicate the date of diagnosis:

Day??

Month

Year

..

..

....

What type of disease?

Goiter = 1

Pain = 2

Nodule = 3

Other = 4

(2) Were you examined for any other type of disease? 1 = No 2 = Yes

If the answer is yes, for what disease? _____

30. Did any other member of your family suffer from a thyroid disease?

Grandfather or grandmother on the father side 1 = No 2 = Yes 3 = I do not know

If the answer is yes, specify what kind: _____

Grandfather or grandmother on the mother side 1 = No 2 = Yes 3 = I do not know

If the answer is yes, specify what kind: _____

Father
know

1 = No

2 = Yes

3 = I do not

If the answer is yes, specify what kind: _____

Mother
know

1 = No

2 = Yes

3 = I do not

If the answer is yes, specify what kind: _____

Sister, brother
know

1 = No

2 = Yes

3 = I do not

If the answer is yes, specify what kind: _____

31. Information about your family. Please tell us about the health of your family.

(1) Father

• Alive

• Age at death •• years

Indicate the cause of death (disease or other reason)

(2) Mother

• Alive

• Age at death •• years

Indicate the cause of death (disease or other reason)

(3) Brothers and sisters

•• Number alive

•• Number dead

Age at death •• years

Indicate the cause of death (disease or other reason)

32. [Changed completely] Have you had any of the following symptoms?

In the neck: pain = 1

pressure or tightness = 2

voice change = 3

trouble swallowing = 4

none of these = 5

Weight change:
no change = 4

Increase = 1 decrease = 2 normal growth = 3

Mood change:
no change = 4

depressed = 1

irritable = 2 tearful = 3

Activity change:

decreased = 1

increased = 2 no change = 3

Muscular: *weakness = 1 cramps = 2 tremor = 3 twitching = 4*
none of these = 5

Temperature: *sensitive to cold = 1 sensitive to heat = 2*
neither of these = 3

Skin change: *dry = 1 scaling = 2 smoother = 3 no change = 4*

Hair change: *thinning = 1 falling out = 2 thin eyebrow = 3*
coarsening = 4 none of these = 5

Eyes: *swelling of eyelids = 1 tearing = 2 pain = 3*
prominent eyes = 4 stare = 5 double vision = 6 none of these = 7

Cardiac changes: *slow pulse = 1 rapid pulse = 2 palpitation = 3*
no change = 4

Bowel movement: *constipated = 1 frequent stools = 2 diarrhea = 3*
normal = 4

Menstruation: *increased = 1 decreased = 2 normal = 3 not applicable = 4*

33. Are you invalid according to our classification?

1 = No

2 = Yes

If the answer is yes, date of registration

Day

Month

Year

••

••

••••

Describe the reason why you are invalid and your type of handicap _____

The questionnaire survey was conducted by: full name of specialist _____

signature _____